

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Palisades Plant PAGE: 1 OF 09

DOCKET NUMBER: 05000255

TITLE: LOSS OF AIR SIDE SEAL OIL IN THE ELECTRICAL GENERATOR
RESULTS IN
A TURBINE/REACTOR TRIP

EVENT DATE: 12/09/91 LER #: 92-001-00 REPORT DATE: 01/08/92

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: N POWER LEVEL: 020

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Cris T. Hillman, Licensing Engineer TELEPHONE: (616) 764-8913

COMPONENT FAILURE DESCRIPTION:

CAUSE: X SYSTEM: TK COMPONENT: GEN MANUFACTURER: W120
REPORTABLE NPRDS: YES

SUPPLEMENTAL REPORT EXPECTED:

ABSTRACT:

On December 9, 1991, at 1630 hours, with the plant operating at 100% power, the turbine building auxiliary operator observed that seal oil pressure on the air side of the electrical generator had decreased from the previous shift reading. Automatic and manual action was taken to restore the seal oil pressure however, pressure continued to drop. It was also observed that hydrogen pressure on the main electrical generator was dropping. At 1715 hours, the Shift Supervisor ordered an emergency power reduction due to a continuing loss of electrical generator hydrogen pressure. During the emergency power reduction, the level in the "B" steam generator went to its high level setpoint which caused the automatic closure of the feedwater regulating valve. Steam generator level continued to increase. At 1722 hours, control room operators initiated both a manual reactor trip and a manual turbine trip due to increased steam generator level. At 1722 hours, with the plant operating at approximately 20% power, an automatic reactor trip on loss of load occurred when the turbine trip was initiated slightly before the reactor

trip.

The cause of the event was a malfunction in the electrical generator seal oil system due to a plugged filter. No root cause for the plugging of the filter was determined.

Numerous short term corrective actions related to minor equipment problems observed during the emergency power reduction were taken prior to re-start of the plant. Long term corrective action includes evaluation and troubleshooting of the main generator air side seal oil system.

END OF ABSTRACT

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EVENT DESCRIPTION

On December 9, 1991, at 1630 hours, with the plant operating at 10070 power, the turbine building auxiliary operator observed that seal oil pressure on the air side of the electrical generator [TK;GEN] had decreased from the previous shift reading. The operator immediately notified the control room of the observed condition. Approximately 35 minutes later (1705 hours) the auxiliary operator observed that the seal oil pressure was continuing to drop. Automatic and manual action was taken to restore the seal oil pressure but at 1714 hours seal oil pressure was observed as continuing to dropping. It was also observed that hydrogen pressure on the main electrical generator was dropping. At 1715 hours, the Shift Supervisor ordered an emergency power reduction due to a continuing loss of electrical generator hydrogen pressure. During the emergency power reduction, the level in the "B" steam generator [AB;SG] went to its high level setpoint which caused the automatic closure of the feedwater regulating valve CV-0703 [SJ;FCV]. Steam generator level continued to increase and it was assumed that the level would approach or exceed the level required for a mandatory trip of the reactor. At 1722 hours, control room operators initiated both a manual reactor trip and a manual turbine trip. At 1722 hours, with the plant operating at approximately 20% power, an automatic reactor trip on loss of load occurred since the turbine trip was initiated slightly before the reactor trip.

The following is a chronological sequence related to this event.

December 9, 1991

1630 Secondary side auxiliary operator notes the air side seal

oil pressure is 85 psig instead of 89 psig as on the last shift. The auxiliary operator reports the discrepancy to the control room. The Shift Engineer notifies the System Engineer of the problem.

1705 Secondary side auxiliary operator reports to the Control Room that seal oil pressure is continuing to drop and is at 82 psig.

1710 P-23 Air Side Seal Oil Backup Pump starts automatically as air side seal oil pressure approaches generator hydrogen pressure.

1711 Control operator informs Region Power Control Jackson, Michigan of the situation and the potential for a power reduction.

1714 Shift Supervisor directs opening of the Backup Regulating Valve Bypass Valve in an attempt to restore air side seal oil pressure. Air side seal oil pressure was approximately 68 psig and dropping along with hydrogen pressure. At this point, a report was received of smoke coming from the generator seals.

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1715 Emergency power reduction is initiated due to a continuing loss of electrical generator hydrogen pressure.

1715 Announcement made for unauthorized personnel to stay clear of the turbine building area due to the loss of hydrogen to the area.

1716 A 4-inch deviation alarm is received for control rod 36. At two times during the rapid power reduction, the control operator shifts to manual individual for this control rod and to drive it back within its group.

1716 During the emergency power reduction, the PCS cold leg temperature drops below 525 degrees F. This places the plant in a limiting condition of operation (LCO) as defined by Technical Specification 3.0.3. The control operators take action to compensate by balancing turbine and reactor power.

1717 An 8-inch deviation alarm occurs for control rod 36 as a

result of it driving in slower than the other rods in its group. This causes entry into the action statement of Technical Specification 3.10 as a result of control rod 17 being previously declared inoperable.

1717 The control operators manually trip main feedwater pump P-1B as part of the emergency power reduction.

1718 PCS cold leg temperature returns to greater than 525 degrees F. This allows exiting Technical Specification 3.0.3. The lowest cold leg temperature reached was 517 degrees F.

1720 PCS cold leg temperature drops below 525 degrees F. The LCO for Technical Specification 3.0.3 is entered. The control operators compensate further for the mismatch between reactor power and turbine demand.

1721 Steam Generator E-50B high level occurs causing an automatic closure of feedwater regulating valve CV-0703.

1722 The control operators simultaneously initiate a reactor and turbine trip as it appears that Steam Generator E-50B level is continuing to rise and will approach the point at which a mandatory trip is required. The highest level reached was 92%.

1722 An automatic reactor trip on loss of load occurs since the turbine trip is initiated slightly before the reactor trip.

1722 Control operator notes that all control rods immediately insert as required with no noticeable lag in drop time for any control rods as indicated by the control rod matrix display and deviation lights.

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1722 Shift Supervisor orders the actions of Emergency Operating Procedure, EOP-1 to be performed.

1723 PCS cold leg temperature returns to greater than 525 degrees F. Technical Specification 3.0.3 is exited. Lowest cold leg temperature during the period was 516 degrees F.

1723 A malfunction in the annunciator alarm bell is thought to have occurred. The Shift Supervisor stations additional personnel to observe for alarms being initiated without an audible alarm.

approx. 1725 Shift Supervisor orders main electrical generator hydrogen to be vented to the atmosphere and the electrical generator purged with carbon dioxide. Shift Supervisor also orders the turbine building roll up doors opened and the roof exhausters started.

1730 EOP-1 is completed with no discrepancies identified. EOP-2 is initiated. GCL-10 checklist is commenced.

1735 An Unusual Event is declared under the miscellaneous category. It is the Shift Supervisor's opinion that plant conditions warrant elevated attention due to the escape of significant quantities of hydrogen gas into the turbine building and the possibility for an explosion.

1743 EOP-2 Safety Function Status Checks are completed with no discrepancies noted.

1743 Notification of the Unusual Event is made to Van Buren County.

1750 Notification of the Unusual Event is made to the State Police-South Haven due to problems contacting the State of Michigan-Lansing with the auto-dialer. Contact with the Lansing representative was finally made by manually dialing the number.

1759 Notification of the Unusual Event is made to the NRC.

approx. 1800 Manually started turbine-generator bearing lift pumps at the System Engineer's request due to concern for inadequate lubrication due to water in the lube oil.

approx. 1830 Steam generator blowdowns are reduced from 30,000 lbs/hr to 18,000 lbs/hr to prevent the flash tank relief from being lifted. Backwash of the Feedwater Purity filters was initiated to place an artificial steam demand on the flash tank.

approx. 1900 Attempted to manually open Steam Generator E-50A main steam isolation valve (MSIV) bypass valve MO-0510 using

the manual operator on the Limitorque operator. The handwheel could be moved only three turns.

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2100 Follow-up notification was made to the NRC stating that the turbine and reactor trips were both initiated by the operators but the turbine was tripped slightly before the reactor which resulted in an automatic reactor trip on loss of load trip.

2120 The Feedwater Purity demineralizer system was started up to begin makeup to Demineralized Water Tank, T-939.

2133 MSIVs were closed to maintain PCS temperature. Since MO-0510 (Steam Generator E-50A MSIV Bypass Valve) could not be opened only Steam Generator E-50B could be used for PCS temperature control.

2316 Reduced condenser vacuum to stop the turbine generator. Turbine generator placed on turning gear.

December 10, 1991

0050 Terminated Unusual Event. Notifications made to the NRC, the State of Michigan and Van Buren County.

This event is reportable to the NRC per 10CFR50.73(a)(2)(iv) as a condition that resulted in the automatic actuation of an Engineered Safety Feature, the Reactor Protection System.

CAUSE OF THE EVENT

The cause of the event was a malfunction in the electrical generator seal oil system. Subsequent investigation determined that the air side seal oil filter was plugged. No root cause for the plugging of the filter was determined.

This event did not involve the failure of equipment important to safety.

ANALYSIS OF THE EVENT

PRE-TRIP CONDITIONS

Conditions prior to the trip were stable with all systems in a normal full power alignment.

The following equipment limitations and restrictions were known:

1. Control rod 17 was considered inoperable as a result of its not being exercised on the required frequency. This condition resulted from the rod having a high seal leak-off temperature and the feeling that biweekly exercising might aggravate the problem. No Technical Specifications action was required for this item provided no other rods became inoperable.
2. Steam Generator E-50A MSIV Bypass Valve MO-0510 was caution tagged with its breaker open stating that it should only be operated manually until motor operator testing was performed for the valve. A packing leak had been previously corrected by tightening the packing gland and use of the motor operator was restricted to prevent damage to the operator.
3. A high water content had been apparent in the main lube oil system for some days prior to the trip. The problem was being evaluated by System Engineering and Westinghouse representatives. Additional sampling of the oil and actions to remove the water were in progress during this period.

POST-TRIP REVIEW ITEMS

An emergency power reduction was initiated as a result of a loss of generator hydrogen pressure due to a malfunction in the air side seal oil system. Evaluation and troubleshooting of the system was performed and it was determined that the air side seal oil filter was plugged.

A turbine and reactor trip was initiated due to a high level in E-50B Steam Generator resulting from slow or unstable feedwater level control at low power.

The following equipment problems and plant conditions were noted during the emergency power reduction:

1. Control rod 36 drove in slower than the other control rods in its group eventually resulting in an 8-inch deviation. Through troubleshooting it was determined that the control rod drive package should be replaced.
2. An increase in radiation levels in the vicinity of the Volume Control Tank, (VCT) and Charging Pump accumulators was

identified when an auxiliary operator noted that he had received approximately 3 millirem checking the area. Normally no readable dose is received. Subsequent surveys showed 30-40 mRem/hour at the charging pumps (pre-trip 7-12 mRem/hour) and greater than 1 Rem/hour at the VCT (pre-trip 50-75 mRem/hour).

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3. Dose equivalent iodine in the PCS increased from 0.028 microcuries/ml to 0.458 microcuries/ml.
4. High radiation alarm occurred briefly on Circulating Water Process Radiation Monitor RIA-1323.
5. The Control Room annunciator audible alarm appeared to malfunction during the power reduction or trip and was thought to not sound for all alarms.
6. Difficulties were encountered in notifying Region Power Control, Grand Rapids, Michigan after the trip. A recorded message gave another number to call.
7. Steam Generator E-50A MSIV bypass valve MO-0510 could not be opened using the Limitorque manual handwheel. Only three turns of the handwheel could be obtained.
8. Announcements of the Unusual Event could not be heard in some areas of the plant. In particular, the PA system in the old demineralizer area of the turbine building and the 590' area of the auxiliary building were problem areas. Work orders were written for these two areas.
9. During emergency notifications, the auto-dialer failed to connect with the State of Michigan-Lansing. Later, contact was successfully made by direct dialing the same number.
10. The telephone on the north end of the turbine deck did not work.
11. The differential pressure indication for Air Side Seal Oil Filter F-65 on the Westinghouse turbine diagnostic (Gen-Aid) system was not available because the computer indicated that the sensor had failed.
12. Nuclear Instrumentation NI-007, for the upper half of the core, did not indicate or track with the other nuclear instruments as

would be expected.

13. Back-up Reactor Protective System (RPS) Breaker 42-2 did not trip with breaker 42-1 when the trip pushbutton on the RPS panel (C06) was depressed by the control operator as part of the post trip actions. A Work Order was written to troubleshoot this problem.

14. A Main Feedwater Pump Low Suction Pressure alarm was noted to occur at one point during the power reduction.

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15. A procedure for venting hydrogen from the main electrical generator for the plant conditions at the time of this event was not found. The procedure for replacing the hydrogen with carbon dioxide requires less than 3 psig hydrogen initially. This situation was brought to the attention of the Operations procedure group for resolution.

16. The procedure for replacing the hydrogen with carbon dioxide requires removal of the hydrogen spool piece prior to aligning carbon dioxide. An option should be provided for emergency situations to isolate the spool piece and remove it later in the procedure. This situation was brought to the attention of the Operations procedure group for resolution.

17. RI-47, "Auto Rod Withdrawal Prohibit Interlock Matrix Check" was initiated prior to obtaining rod drop times from critical functions monitor (CFMS). RI-47 causes the times to be overwritten and lost. The drop times are required for the post trip review process of Administrative Procedure 4.08.

CORRECTIVE ACTION

The following corrective actions were taken prior to start-up from this event:

1. The air side seal oil failure was caused by plugging of the air side seal oil filter. The filter was disassembled, cleaned and re-assembled. No unusual debris was found in the filter. No actual root cause for why the filter was plugged was determined, however, it appears that plugging of the filter may be related to the high water content in the turbine lube oil system.

2. The drive package for control rod 36 was replaced. Control rod 36 was tested and determined to perform satisfactorily.
3. Adjustments were made to the steam generator level control system. During plant start-up from this event the level control system was monitored continuously by operators and the I&C group. Several adjustments were made during start-up to fine tune system response.
4. The Control Room annunciator alarm bell plunger and several alarm cards were replaced. Troubleshooting could not re-produce the problem of the bell not sounding for alarms.
5. The public address (PA) system was walked down by I&C. Several adjustments were made to the local stations identified as problem areas during this event to restore operability.

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6. The emergency notification auto-dialer was re-programmed and verified to operate properly.
7. The NI-07 problem was determined to be a problem with the datalogger and not the NI.
8. The failure of back-up RPS breakers 42-1 and 42-2 was determined to be a problem with the reactor trip pushbutton on the RPS panel (C-06). The pushbutton was replaced however, incomplete depression of the pushbutton could still result in the failure of one of the two breakers to perform its trip function. A caution placard was mounted next to the pushbutton to warn the operators. The operators were also briefed on the problem.

The following long term corrective actions were assigned:

1. Evaluate and troubleshoot the performance of the main electrical generator seal oil system. Provide additional corrective actions based on the troubleshooting.
2. Evaluate and troubleshoot the performance of the public address (PA) system.

ADDITIONAL INFORMATION

None

ATTACHMENT 1 TO 9201150048 PAGE 1 OF 1

Consumers
Power

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General Manager

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Nuclear Regulatory Commission
Document Control Desk
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DOCKET 50-255 - LICENSE DPR-20 - PALISADES PLANT -
LICENSEE EVENT REPORT 92-001-LOSS OF AIR SIDE SEAL OIL IN THE
ELECTRICAL
GENERATOR RESULTS IN A TURBINE/REACTOR TRIP

Licensee Event Report (LER) 92-001 is attached. This event is reportable
to the NRC per 10CFR50.73(a)(2)(iv).

Gerald B Slade
General Manager

CC Administrator, Region III, USNRC
NRC Resident Inspector - Palisades

Attachment

A CMS ENERGY COMPANY

*** END OF DOCUMENT ***
